[0059] **CLAIMS**

[0060] We claim:

1. A high purity aluminum alloy with controlled particulate size and distribution of mobile impurities present in said alloy, said high purity aluminum alloy being employed in the manufacture of semiconductor processing apparatus where exposure to corrosive environments would degrade an aluminum alloy which does not exhibit controlled mobile impurity particulate size and distribution, said high purity aluminum alloy having mobile impurity particulates within specific limits so that at least 95 % of all particles are 5 μm or less in size, no more than 5 % of said particles range between 20 μm and 5μm, and no more than 0.2 % of said particles range between 50 μm and 20 μm.

2. A high purity aluminum alloy in accordance with Claim 1, wherein no more than 0.1 % of said particles range between 50 μm and 20 μm.

3. A high purity aluminum alloy in accordance with Claim 2, wherein no more than 0.1 % of said particles range between 40μm and 20 μm.

4. A high purity aluminum alloy in accordance with Claim 1, wherein no more than 0.2 % of said particles range between 40 μm and 20 μm.

5. A high purity aluminum alloy in accordance with Claim 1 or Claim 2, or Claim 3, or Claim 4, wherein said particulates are formed from mobile impurities selected from the group consisting of magnesium, silicon, iron, copper, manganese, zinc, chromium, titanium, and compounds thereof.

6. A high purity aluminum alloy in accordance with Claim 1 wherein said

alloy includes mobile impurities present at the following concentrations or at lower concentrations, magnesium at 4.0 weight %, silicon at 0.03 weight %, iron at 0.03 weight %, copper at 0.07 weight %, manganese at 0.015 weight %, zinc at 0.16 weight %, chromium at 0.07 weight %, titanium at 0.01 weight %, and wherein a total of other impurities present in said aluminum alloy ranges from 0 - 0.1 weight %, with individual other impurities limited to 0 - 0.03 weight % each.

7. A high purity aluminum alloy in accordance with Claim 6, wherein said magnesium is present at a concentration ranging between about 3.5 weight % and about 4.0 weight %.

8. A method of producing a corrosion-resistant article for use in semiconductor processing apparatus, wherein said article comprises a body formed from high purity aluminum alloy, and wherein at least a surface of said body which is to be exposed to a corrosive environment is covered with an aluminum-oxide-comprising film, and wherein at least said surface of said body which is covered said aluminum-oxide-comprising film is an aluminum alloy having mobile impurity particulates controlled within limits so that at least 95 % of all particles are 5 μm or less in size, no more than 5 % of said particles range between 20 μm and 5μm, and no more than 0.2 % of said particles range between 50 μm and 20 μm.

9. A method in accordance with Claim 8, wherein no more than 0.1 % of said particles range between 50 μm and 20 μm.

10 A method in accordance with Claim 9, wherein no more than 0.1 % of said particles range between 40μm and 20 μm.

11. A method in accordance with Claim 10, wherein no more than 0.2 % of said particles range between 40 μm and 20 μm.

12 A method in accordance with Claim 8, wherein said particulates are formed from mobile impurities selected from the group consisting of magnesium, silicon, iron, copper, manganese, zinc, chromium, titanium, and compounds thereof.

13. A method in accordance with Claim 8, wherein at least a portion of said aluminum alloy body of said article comprises mobile impurities present at the following concentrations or at lower concentrations, magnesium at 4.0 weight %, silicon at 0.03 weight %, iron at 0.03 weight %, copper at 0.07 weight %, manganese at 0.015 weight %, zinc at 0.16 weight %, chromium at 0.07 weight %, titanium at 0.01 weight %, and wherein a total of other impurities present in said aluminum alloy ranges from 0 - 0.1 weight %, with individual other impurities limited to 0 - 0.03 weight % each.

14. A method in accordance with Claim 13, wherein said magnesium is present at a concentration ranging between about 3.5 weight % and about 4.0 weight %.

15. A method in accordance with Claim 8 or Claim 10, or Claim 13 or Claim 14, wherein said corrosion-resistance is with respect to active halogen-containing species.

16. A method in accordance with Claim 15, wherein said active halogen-containing species are present in the form of a plasma.

17. A method of creating an aluminum oxide protective film on the surface of a high purity aluminum alloy, comprising: exposing said surface of said aluminum

alloy to an electrolytic oxidation process during which said surface is immersed as an anode in an acid electrolyte, with a cathode comprised of an aluminum alloy, and wherein a DC current is applied, wherein said acid electrolyte is a water-based solution comprising 10 % to 20 % by weight sulfuric acid and about 0.5 % to 3.0 % by weight oxalic acid, wherein said protective film is created at a temperature ranging from about 5 °C to about 25 °C, and wherein an applied current density of said DC current ranges from 5 A/ft^2 to 36 A/ft^2.

18. A method according to Claim 17, wherein, prior to exposing said aluminum alloy surface to said electrolytic oxidation process, said surface is cleaned by contacting said surface with an acidic solution which includes about 60 % to 90 % by weight of technical grade phosphoric acid, having a specific gravity of about 1.7, and about 1% - 3 % by weight of nitric acid, wherein said cleaning is carried out with said aluminum alloy surface at a temperature in the range of about 100 °C, for a time period ranging from about 30 seconds to about 120 seconds.

19. A method in accordance with Claim 18, wherein subsequent to said cleaning of said aluminum alloy surface and prior to said electrolytic oxidation process, said surface is rinsed with a deionized water rinse.

20. A method in accordance with Claim 17, or Claim 18, or Claim 19, wherein said aluminum oxide protective film exhibits hexagonal cells having internal pores ranging in size from about 300 Å to about 750 Å in diameter.

21. A method in accordance with Claim 17, or Claim 18, or Claim 19, wherein mobile impurity particulates present in said high purity aluminum alloy are limited so that at least 95 % of all particles have particle size of less than 5 μm, no more

no more than 5 % of said particles have particle size range between 20 μm and 5μm, and no more than 0.2 % of said particles have a particle size range between 50 μm and 20 μm.

22. A method in accordance with Claim 17, or Claim 18, or Claim 19, wherein said high purity aluminum alloy comprises mobile impurities present at the following concentrations or at lower concentrations, magnesium at 4.0 weight %, silicon at 0.03 weight %, iron at 0.03 weight %, copper at 0.07 weight %, manganese at 0.015 weight %, zinc at 0.16 weight %, chromium at 0.07 weight %, titanium at 0.01 weight %, and wherein a total of other impurities present in said aluminum alloy ranges from 0 - 0.1 weight %, with individual other impurities limited to 0 - 0.03 weight % each.

23. A method in accordance with Claim 21, wherein said high purity aluminum alloy comprises mobile impurities present at the following concentrations or at lower concentrations, magnesium at 4.0 weight %, silicon at 0.03 weight %, iron at 0.03 weight %, copper at 0.07 weight %, manganese at 0.015 weight %, zinc at 0.16 weight %, chromium at 0.07 weight %, titanium at 0.01 weight %, and wherein a total of other impurities present in said aluminum alloy ranges from 0 - 0.1 weight %, with individual other impurities limited to 0 - 0.03 weight % each.

24. A method in accordance with Claim 17, wherein, prior to creating said aluminum oxide protective film on said high purity aluminum alloy surface, said aluminum alloy is heat treated to relieve stress and increase hardness, wherein said heat treatment is carried out at a temperature of 330 °C or at a lower temperature.

25. A method in accordance with Claim 18 or Claim 19, wherein prior to creating said aluminum oxide protective film on said high purity aluminum alloy

creating said aluminum oxide protective film on said high purity aluminum alloy surface, said aluminum alloy is heat treated to relieve stress and increase hardness, wherein said heat treatment is carried out at a temperature of 330 °C or at a lower temperature.

26. A method in accordance with Claim 21, wherein, prior to creating said aluminum oxide protective film on said high purity aluminum alloy surface, said aluminum alloy is heat treated to relieve stress and increase hardness, wherein said heat treatment is carried out at a temperature of 330 °C or at a lower temperature.

27. A method in accordance with Claim 23, wherein, prior to creating said aluminum oxide protective film on said high purity aluminum alloy surface, said aluminum alloy is heat treated to relieve stress and increase hardness, wherein said heat treatment is carried out at a temperature of 330 °C or at a lower temperature.